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## L2 processing is affected by RAGE: Evidence from reference resolution

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Native-language processing involves not only information *integration*, but also *anticipation*, or *prediction*,<sup>[1,2,3]</sup> for both adults and children.<sup>[4,5]</sup> An open question, which our study seeks to address, is to what extent adult non-native speakers use predictive processing.

Recent work on grammatical gender reveals a dissociation in L2 performance on tasks requiring information integration vs. those requiring anticipation: L2ers perform like native speakers on comprehension tasks involving (ungrammatical) gender-mismatch between nouns and post-nominal adjectives, i.e., disruption of information integration at the adjective;<sup>[6,7]</sup> however, on tasks assessing whether gender cues allow anticipation of *upcoming* information, even highly proficient L2ers differ from native speakers.<sup>[8,9]</sup> Based on such observations, we propose that *non-native speakers have Reduced Ability to Generate Expectations (RAGE) during language processing*. Here we present evidence from a different realm of language processing—reference resolution—in support of this hypothesis.

A story-continuation task (adapted from [10]) was completed by 20 advanced L2 learners of English (12 L1-Japanese, 8 L1-Korean) and 24 native speakers; they wrote continuations following a context sentence that described a transfer-of-possession event (see (1)). A 2x2 design varied *aspect* in the context sentence (perfective/imperfective) and *prompt type* in the continuation (pronoun/free). Trained judges identified the intended referent of the subject of the continuation, coding for SOURCE (of the context sentence; see (2)), GOAL (3), ambiguous, or other. Previous work shows that native speakers' coreference expectations on this task are modulated by verbal aspect: Transfer-of-possession events yield more GOAL-continuations when marked by perfective compared to imperfective aspect.<sup>[10,11,12]</sup> This effect has been tied to *end-state salience*: perfectives describe completed events compatible with end-state focus (here focus on the GOAL), whereas imperfectives describe ongoing events with no salient end-state. End-state salience (perfective) guides native speakers' expectations about who will be mentioned next, in this case favoring re-mention of the end-state referent (GOAL). If, in accordance with the RAGE hypothesis, non-native speakers are less able to engage in predictive processing, the effect of aspect on reference resolution should be reduced in the L2 group, yielding a significant aspect-by-group interaction.

To test this meaningfully, we first need assurance that participants comprehend aspect. They thus also participated in a truth-value judgment task (adapted from [13]). Results from this task (Fig.1) indicate clear discrimination between imperfective and perfective aspect, with no significant between-group differences. Results from the story-continuation experiment (Fig.2), by contrast, show differential performance by the two groups, critically reflected in the predicted aspect-by-group interaction ( $F_{(1,42)}=6.53$ ,  $p<0.05$ ), driven by the influence of aspect on proportion of GOAL-continuations/SOURCE-continuations (for prompts of both types) by native but not non-native speakers. Moreover, L2ers showed an unexpected overall GOAL-bias, potentially reflecting a recency bias, similar to that previously observed with L1 children.<sup>[14]</sup> This may point toward processing limitations as an underlying explanation for RAGE: If processing resources are exhausted by information *integration*, little is left for *anticipatory* processing. In consequence, non-native speakers generate fewer expectations that may affect reference resolution, relying instead on more superficial heuristics, such as recency, when interpreting ambiguous pronouns.

- (1) Patrick gave/was giving a towel to Ron. (He) \_\_\_\_\_
- (2) He made sure to give him a clean dry one. (SOURCE-continuation for (1), i.e., *he* = Patrick)
- (3) He said “Thank you.” (GOAL-continuation for (1), i.e., *he* = Ron)

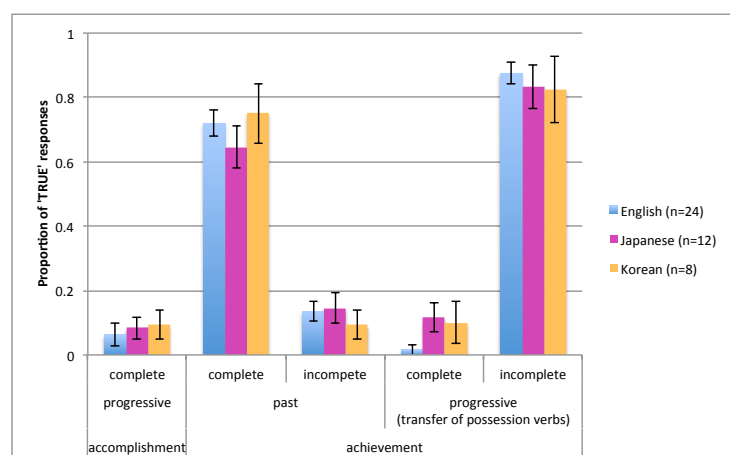


Figure 1. Proportion of ‘true’ responses by condition and group.

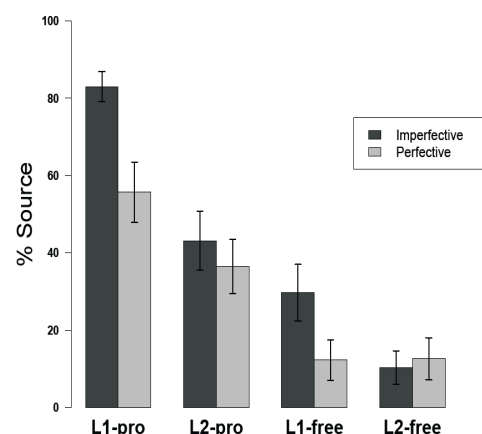


Figure 2. Proportion of SOURCE-continuations (out of the total SOURCE- plus GOAL-continuations) by group (L1, L2) and prompt type (pronoun, free).

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